

Patuxent Science Symposium
75th Anniversary
October 13-14, 2011

This transcript is Part 4 of 4 and features the speakers listed below for the 75th Anniversary of the Patuxent Research Center. They talk about their work and experiences while working at Patuxent.

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Patuxent Science Symposium
Friday
Session Moderator: Judd Howell

Judd Howell introductory: Dr. Robert Reynolds

Judd Howell:

The last day and a half has really been a celebration of Patuxent's history and where we've been and how we've gotten here. And this afternoon is going to be about what we are doing... Okay, about what we are doing and what we want to do, what our future will be.

And in that vein, since we have paid homage to the area when we were in the Fish and Wildlife Service. Now you see it? Now you don't. We're stepping more into the era of those of us who have served not only at Patuxent, but served our tenure under the auspices of the U.S. Geological Survey, hence the shirt.

Our first speaker, though, is going to talk to us about an organization that has been transcendent beyond the vagaries of this reorganization, that reorganization, or every other reorganization that's taken place since 1887, I believe.

Our speaker is Dr. Robert Reynolds. And you know, Bob, I didn't realize that the pay freeze has affected your haircut budget, but I would like you, I would like to invite you to the podium to tell us about the Biological Survey Unit at the Smithsonian and its august history, and welcome.

Dr. Robert Reynolds:

Thank you Judd, I'm actually surprised that you noticed my hair, so.

I'd like to give you a review of the history and current activities of the Biological Survey Unit. Biological Survey Unit is a field station of Patuxent that's located at the Smithsonian's National Museum of Natural History on the Mall in Washington, D.C.

The United States has a long history of working on wildlife species, and an equally long history of building and maintaining museum collections.

The Biological Survey traces its roots back to 1885 in the Department of Agriculture. And in 1889, a formal partnership was created with the United States National Museum for the deposition of scientific specimens that were collected during the activities of the Biological Survey.

The focus at that time was to collect animals and plants from throughout the United States, Canada, and Mexico for the purpose of documenting, species identifications, occurrence, and distribution, and also for preserving scientific specimens for deposit in the National Museum.

Part of this agreement also stipulated that Biological Survey staff would be permanently housed in the National Museum to conduct systematic research on the specimens they collected, as well as to care and manage the North American collections of terrestrial vertebrates at the museum.

The first chief of the Biological Survey was C. Hart Merriam. Merriam was also the first president of the American Society of Mammalogist and Merriam was clearly a biogeographic pioneer, and actually coined the term 'biogeography.'

Here we have a impressive array of early bioge..., Biological Survey employees, including Ira Gabrielson, Frederick Lincoln, Alexander Wetmore, Edward Nelson, C. Hart Merriam, Edward Goldman, A. K. Fisher, and others. And the one thing I'd like you to notice about these individuals is the very serious look on their face, and the obvious formal dress that was required at that time. I will contrast that shortly with our current employees.

The Biological Survey has a long history of bio..., biodiversity research. We are involved in vertebrate systematics. And systematics is the study of evolutionary relationships among species as well as the identity, the identification of species, the naming of species, and the classification of species.

Some famous work that was done by early Biological Survey Investigators is... one example is Biological Investigations in Mexico that was published in 1951 by Edward A. Goldman. But Edward Nelson and Edward Goldman literally covered the entire country of Mexico making biological collections, all of which ended up at the National Museum and remain there today.

Faunal surveys continue to this day, although as you can see on the right in this picture that the mode of transportation has changed somewhat. This is a trip that we were making in Peru, and actually had the military helicopter helping us.

And in 2005, a recent example of our compilation of the survey work was a publication on the terrestrial vertebrates of the Guiana Shields.

We currently have 12 employees and one American scientist in the Biological Survey. They're stationed in the Department of Vertebrate Zoology in the Divisions of Birds,

Mammals, and Amphibians and Reptiles. And in this photo gallery we have Mercedes Foster, Dick Banks, Terry Chesser, Claudia Angle, and Roger Clapp in the Division of Birds; Bob Fisher, Suzy Peurach, Al Gardner, and Neal Woodman in the Division of Mammals; and Steve Gotte, James Poindexter, Roy McDiarmid, and myself in the Division of Amphibians and Reptiles.

Note, in this series of photographs our staff are actually smiling, and also note that the mode of dress has markedly improved over that from our predecessors.

What does museum work involve? This is unfortunately the classic image that many people have, of old decrepit scientists studying old decrepit dead animals. In fact, museum science is very exciting and it entails lots and lots of things. We work on exhibits, collection management, research on the collections, various kinds of training, and provide much service based on the collections that we maintain.

A big part of our job is acquiring specimens, either through active fieldwork of our own or also getting collections from researchers from around the world, to preserve and manage those scientific collections at the museum. These collections are critical for documenting the science that's being conducted by the people working on these specimens. They have to have the materials deposited in a safe and secure museum.

Major research areas that we're working on are collection-based research, evolutionary systematics and the naming of organisms.

As I mentioned earlier, a major effort that we continue to do to this day is going out and collecting animals and increasing our knowledge about biodiversity. And documenting through museum specimens at the museum.

We have, our current staff have named a very impressive array of new animals. Al Gardner, Neal Woodman, and Dick Banks have identified and described a total of 33 mammal species, which include rodents, bats, voles, and possums. Roy McDiarmid, Steve Gotte, Mercedes Foster, and I have described a total of five snakes, three lizards, 14 frogs and toads. And Mercedes has actually described one species of lizard and three species of plants.

A description that I had the most fun with was a new species of frog from Bolivia that Mercedes and I coauthored. The genus of the frog was, is *Colostethus*, and the name we chose for it was *mcdiarmidi* in honor of Roy McDiarmid. And the fun part about this is that Roy McDiarmid had no idea that we were naming this frog for him, and he didn't find about it until he opened his copy of the Journal when it arrived.

However, whoops, however, that's the end of my talk. However, the most recent animal to be described by one of our staff is this striking short-tailed python, python kyaiktiyo, by Steve Gotte that just appeared on the front cover of the August, 2011 Proceedings of the Biological Society of Washington. Most important is that this photograph is of the animal when it was still alive. But I can assure you that the animal is preserved, and is now a thing of beauty and a joy forever in the type collection at the Division of Amphibians and Reptiles.

Our unit has curatorial responsibility for nearly one million North American amphibian, reptile, bird, and mammal museum specimens.

Other major areas that our staff are involved with is comparative anatomy and development, distribution, biogeography, ethnozoology, ethnobotany, ecology, evolution, conservation, population genetics, and paleontology.

We are all very much involved in training of postdocs, predocs, graduate and undergraduate students, interns and participating in workshops, both nationally and internationally. And here is Suzy Peurach in the Division of Mammals, providing instruction to workshop participants and interns.

Along with other forms of training that we do is the books that were produced for measuring and monitoring biological diversity on amphibians and reptiles and mammals. And this is to standardize efforts throughout the world to, so that researchers all try and do the same sorts of measuring and monitoring of biodiversity.

We provide to federal agencies, state agencies, universities, researchers, NGOs primarily information about the collections that we manage as well as information about the animals that we are experts on.

Another service that we provide is to accept collections from researchers from around the world in order to voucher their research and maintain their databases and maintain the research collections.

Our unit has authored an impressive array of systematic and biodiversity resources for use by wildlife and conservation managers. And here are examples for amphibians, reptiles, mammals, and birds which are used by the scientific community around the world. And many cases are the standard by which all systematic research is compared.

Two of the most recent books by Biological Survey Unit staff are the Mammals of South America, edited by Alfred Gardner. And more recently, Reptile Biodiversity Standard Methods for Inventory and Monitoring, edited by Roy McDiarmid and Mercedes Foster.

Historically, the systematic work that we did was based primarily on morphology of the museum specimens.

Molecular genetics is becoming an increasingly important tool in museum systematic work. And our unit became involved in systematics when we thankfully hired Terry Chesser as a curator of Ornithology in 2005.

Some examples of our current and future research includes work on the AOU (American Ornithologists Union) Check-list of Birds by Terry Chesser and Dick Banks. Mercedes Foster and Terry Chesser are working on systematics and evolution of Neotropical birds. Terry continues work on the seasonal and geographic distribution of South American austral migrants; this is an extension of his dissertation work. Roger Clapp is working on the breeding birds of Virginia. And Mercedes continues studies on Neotropical studies of avian frugivores and characteristics of fruit resources. And Claudia Angle is primarily responsible for managing the scientific collections for use by scientists as well as for arranging for visitor use of the collections, and she handles visitors from all around the world that come to the museum just to study these birds.

Continuing with mammals; Al Gardner is working on a third volume of the Mammals of South America. Neal Woodman is working with the State of California on the taxonomic status of the California shrew. Neal is also continuing work on the fore foot anatomy of tree shrews. Both Al and Neal are involved in various new..., descriptions of new species of bats, voles, and shrews from Middle America. Suzy Peurach continues her long-term studies on bat hair identification that she gets from aircraft strikes with United States Air Force planes. And I guess bats will never learn that they are no match for fighter jets or any other aircraft.

Bob Fisher has just, within the last couple of weeks, finished a catalogue of the Mammal Type Specimens at the National Museum, and has submitted it for publication in the Smithsonian Contributions to Zoology. And has now begun work on the second volume of the Mammal Type Specimens at the museum.

And last but not least, and arguably the most interesting, is the work being done in the Division of Amphibians and Reptiles.

I'm currently working on a book with coauthors from the American Museum and the Royal Ontario Museum on the amphibians and reptiles of Guyana, where we are compiling information on all 320 species of amphibians and reptiles.

Roy is working on Volumes II and III of the Snakes Species of the World, which will

complement the first volume that's already been published.

Steve Gotte is finishing up a synonymy of the snake genus *Leptophis*.

Roy is also working on the history of herpetology and herpetologists in the Department of the Interior.

I'm working with a Smithsonian colleague on the descriptions of two new blind snakes from the eastern Caroline Islands of Micronesia.

Roy is working with Ron Alton of Mississippi State University on a handbook of larval amphibians.

And Steve Gotte and I are continuing a study on the effects of formalin vs. alcohol preservation for larval amphibians.

And James Poindexter is primarily responsible for taking digital photography of preserved amphibians and reptiles in our collection for use by researchers, both at the museum as well as around the world. And James's photographs of dead animals are appearing in journals all around the world.

Thank you very much.

Judd Howell:

Thanks, Bob.

Dr. Robert Reynolds:

You bet.

Judd Howell:

But don't go away. We actually have a few minutes for questions. And let's see if we can get this thing to work again. It does work so.

Audience Member:

I don't want to be the first to ask questions in all of these august scientists here, but this has been so inspiring. I would like to ask the speaker what one, just to put a name on the new snakes as a herpetologist; you said five and I had one final (unclear: 21:26) just so we know. I assume it was not a subspecies or species of poisonous, or we would have heard of it in some way. Do you have the name?

Dr. Robert Reynolds:

That new snake?

Audience Member:

Yes.

Dr. Robert Reynolds:

Was Python kyaiktiyo; that new snake that was on the cover of the Proceedings of the Biological Society of Washington was named Python kyaiktiyo. And the way we choose, and I'm speaking for Steve Gotte who's in the audience, but I can tell you that the way we chose the name is typically something to do with the morphology of an animal or with the location where the animal was collected. And actually that name kyaiktiyo was named for kyaiktiyo pagoda in Burma, where the snake was captured, and it translates to golden rock. And I know this because I just read the paper.

Audience Member:

And the other one was, and you gave maybe one of the best answers, you know, such as Roxie Laybourne, who had such great contributions to. Maybe I'm just throwing this out; somebody tonight will have a story about Roxie. I know Bob Hines had many, but I'd be glad to hear something.

Dr. Robert Reynolds:

Yeah, Roxie, of course, is a legend in the museum. If you have the opportunity to talk to Claudia Angle, Claudia probably, and Mercedes Foster; Claudia and Mercedes were personal friends of Roxie and knew her very, very well.

Judd Howell:

Great, thank you Bob.

Patuxent Science Symposium

Friday

Session Moderator: Judd Howell

Judd Howell introductory: Dr. Donald Cahoon

Judd Howell:

Okay, our next speaker is Dr. Donald Cahoon. And Don, I can probably guarantee that in his family there is a haircut budget because I'm pretty sure Elizabeth makes sure he gets his hair cut.

Don's going to talk to us about his global climate change research and his work on the marsh vegetation and accumulation, vertical rise and fall and all those kinds of things.

So, thank you, Don.

Dr. Donald Cahoon:

Well, good afternoon. I don't normally use notes, but I decided I had to do some notes because the last day and a half we've seen some really fabulous talks about the history of this place. And so I thought, "Okay, when and how did the Coastal Ecosystems Group come into effect?" And, "What is its history?" So I asked a lot of people last night over wine and cheese, and these are a few of the facts, I think, that we can come up with.

There was general consensus that the Coastal Ecosystems Group came into being about 1995, and it would seem like there's probably three factors, could be more, could be less. That the confluence of these three factors led to the development of this group of researchers here.

The first one being, of course, money; in 1990 was when the climate change program funding became available. So you always got to have money. But that money was, of course, designated for climate-related research, which is..., could also be more process-based, more ecosystem level-based.

The second factor was probably the creation of the National Biological Survey, because a lot of people from other agencies outside Fish and Wildlife Service ended up here at Patuxent. Most notably, the Park Service's Coastal Lab in Rhode Island. And there was some process-based researchers there; Charlie Roman in Wetland Ecology, Jim Allen in Coastal Geomorphology. So there was the germ of some new process-based ecosystem level researchers arriving here.

And then I think probably it's safe to say that when Jim Kushlan arrived in 1995, he put a push on this ecosystem level process-based kind of research through hiring several new scientists; Jan Keough, Glenn Guntenspergen, and Hilary Neckles, and myself.

And during that time there was also a realignment of some people that were already here, including Mike Erwin and Mary Freeman.

So you see here a list of people that are currently in the Coastal Group, but that's not everybody that's ever been in the Coastal Group here. Let me just read you a quick list of names, that would be Charlie Roman, Paul Buckley from the Coastal Lab in Rhode Island, Jim Allen from that lab in Rhode Island who, after his passing, was replaced by Cheryl Hapke, Howie Ginsberg, Janet Keough, Glenn Guntenspergen and Hilary

Neckles, Mike Erwin, Mary Freeman, and myself.

So, as best as we can tell, that's the history of the Coastal Eco..., the history of the evolution and creation of the Coastal Ecosystems Group here.

If I left anybody out I'm sorry, I apologize right now. If anybody has more information to correct what I just said, please say so.

Alright, let me just run through this real quick. Who does what? Mike Erwin, of course, you know, you heard his talk yesterday; Mary Freeman works on streams in Georgia; Glen is a landscape ecologist, and works in coastal wetland systems as well; Matt Kirwan is a former post doc of Glen and mine; Glen is also a modeler and Matt is a modeler; and Hilary Neckles works mainly in sea grasses.

Alright, the Department of the Interior's Mission Statement according to the most recent GPRA Strategic Plan is something that we all work in response to. 'The U.S. Department of the Interior protects and manages the Nation's natural resources and cultural heritage, and provides scientific and other information about those resources.' And we just listened to a day and a half of some really fabulous information about the science and information that's been collected here at Patuxent.

But today, what I'm going to talk about now is more ecosystem level process-based kind of research that our group is doing. And this is a list of our goals from the U.S., from the Patuxent Strategic Science Plan, latest edition being 2008:

First of all, we are trying to develop scientifically based methods for understanding ecosystem changes in coastal and freshwater ecosystems. And develop tools for forecasting future conditions under different scenarios.

Secondly, we're developing the scientific bases for regional comparisons of coastal and freshwater systems, and the ability to generalize at greater spatial and temporal scales.

Thirdly, we are developing the scientific bases for monitoring programs capable of detecting and predicting changes, forecasting changes maybe, in the status of coastal and freshwater ecosystems.

And lastly, improve the scientific bases for restoration and mitigation of impaired or altered freshwater and coastal ecosystems.

The research focus for our group focuses on three main areas; environmental monitoring, ecological forecasting, and wetland restoration through integrated and multidisciplinary science addressing global change effects.

Now this graphic is adaptive from a Park Service Vital Sign's Monitoring Plan for the Northeast Coastal and Barrier Network. Basically, what you see across the top are threats to coastal ecosystems. And they stem from indirect human impacts of land use in the surrounding watershed, direct impacts, direct human impacts in the form of physical habitat alterations, and long-term impacts of a changing global climate.

The effects of human activities can be exacerbated by natural disturbances including severe weather and biotic, geomorphic, and climatic processes.

So collectively, these anthropogenic and natural disturbances produce a multitude, and you see the stressors, a multitude of stressors in the center portion of this cartoon, with far-reaching consequences. Ranging from (across the bottom) degraded habitat structure to major shifts in ecosystem function. In many cases, the long term and cumulative effects of multiple stressors on the structure function and sustainability of coastal habitats are unknown, and this is the motivation for a lot of our research.

Another point that we would like to make in our approach to this research is that context matters. It matters where you are in the landscape in terms of your hydrology and your geomorphology. And it matters what your current environmental condition is, whether you're pristine or degraded (eutrified, high levels of nutrients, highly physically altered).

So let's take a look at an example of context mattering in terms of geological framework, and this will explain some of the diversity of the kind of things that we do in our crew. Now this is summarizing basically what Jim Allen and then Cheryl Hapke have done here at, here at Patuxent.

Across the bottom here you see that the marine geologic framework, marine geological processes, coupled with physical oceanographic processes, will strongly influence your local coastal geomorphology. And this is a graphic cartoon of a coastal barrier island of dunes and back-barrier marshes on it.

And this bottom line, the geologic framework and the physical evolution of rapid processes is the kind of work that's done by our colleague in geologic discipline like at Woods Hole Field Science Center.

And clearly these, the framework of oceanic processes influence the global geomorphology. And of course, the local setting has a strong influence on the coastal ecosystems and the human use of that system. And this is the work that we do here at Patuxent, that you others do as well.

And then so the question becomes, "What are these influences?" The questions that Jim Allen and Cheryl Hapke were addressing, of course, are, "How do these different physical processes influence the local geomorphic setting." So, as I said, then ultimately affects the coastal ecosystem.

Now, this work on local coastal geomorphology is not occurring here at Patuxent anymore because Cheryl Hapke has recently transferred to the Woods Hole group.

The second point we want to make about context mattering is, is process responses. We want to be able, as we said in one of our goals, predict the persistence of coastal wetlands to global change effects.

The goals would be to understand the linkages and feedback effects that control habitat stability of coastal wetlands, specifically how wetlands maintain surface elevations relative to sea level.

And also determine how external forcing functions, such as sea level rise, nutrient enrichment, other things interact with these internal processes to affect ecosystem stability.

And thirdly, to develop a predictive capacity to forecast future responses of coastal wetlands to changes in external forcing functions. And this would be accomplished through modeling.

So let's just take a quick look at our approach to this. Our Patuxent Science will, we first of all will conduct manipulative experiments to identify critical processes controlling sustainability. And I show you a..., and then we collect and interpret the data to determine process responses to environmental change. And I show a photograph here of a project we did jointly with the Smithsonian Environmental Research Center on enhanced CO₂ impacts on a marsh right out here at Edgewater, Maryland.

And what we found was, just to give you an example, that when you dose this marsh, which is predominantly C₃ species, the C₃ plants grow much more rapidly when you dose them with high levels of CO₂, but not the C₄ plants.

So you get this increased in above-ground and below-ground productivity in the C₃ plants, which increases root growth, which increases elevation.

So the irony is that increased CO₂ causes sea level to rise, but for some of these plants in this marsh, that increase in CO₂ actually leads to an increase in elevation and helping it to keep pace with that sea level rise.

The other interesting thing we found out from the study is that when we added nitrogen to some of these plants, it completely turned off the CO₂ stimulation.

So it completely matters whether or not your marsh is in a pristine or polluted eutrofied system, because the process response will be completely different.

So we provide these kinds of data to modelers to improve forecasts and to coastal managers to inform decision making.

This is a..., 'Secure' is a Global Network of Elevation and Landscape Resilience Data, stands for Sustainable Ecosystems for Coastal, Urban, and River Environments. This is one of the monitoring networks basically that we use to help inform our science.

Secure is an *ad hoc* global monitoring network using a common methodology of the Surface Elevation Table - Marker Horizon Method, a method that I have developed and promoted over the past couple of decades.

And national scale, you see here, this methodology is used in every coastal state, except for Hawaii, in the United States. And we use data from this network to identify critical factors and processes controlling coastal wetland elevation dynamics for a diversity of wetland settings.

And the data are also used to calibrate models and produce forecasts. And in many cases, the findings are provided to the landowners, especially the federal landowners such as Fish and Wildlife Services and our NPS partners.

Now we do the same thing on a global scale. The network currently consists of sites in 26 countries on every continent except Antarctica. I'm not sure we can drive the benchmarks into ice, I guess we could.

And one of the latest things that we're doing with this approach is we're taking the locations of our current network sites and overlapping it, overlaying it with a map of highly vulnerable coastal wetland areas in the world. Try to identify for everybody out there where we might want to start going next with some of the expanding of this network. And this, hopefully, will be accepted and come out soon.

Alright, again context matters. Let's talk about forecast and how context matters. This is work that Glen and Matt Kirwan have been actively involved with. Again, using, as you see here on the left, using like a network of sites, which includes SET sites and manipulative experiments to...

So we use these to monitor conditions and understand trends and the manipulative experiments to parameterize the models, and then run these models in simulations. You see an example of a simulation of, of a wetland under different conditions of sea level rise ([cross spot on here: 37:56](#)). And we develop these models to forecast the fate of coastal wetlands.

An example of work that was sort of a combination of the SET monitoring and modeling and biology of species and so forth is work that Mike Erwin got funding for through the climate change program.

And we put out SET - Marker Horizons in salt marshes and in shallow ponds to look at how these environments, these habitats for the birds were responding to local sea level in a series of lagoonal, back-barrier lagoonal marshes on the east coast of the United States.

And then Matt, I mean, excuse me, and then Mike and Di Prosser and Geoff Sanders evaluated the bird habitats, and evaluated the vulnerability of the habit..., of the birds from these habitats to changes in the sea level and climate change.

You also saw several examples yesterday from Mike on the work that he's doing on islands, such as Poplar Island and other work here in the Bay as well.

Context matters also in terms of restoration and management. We try to provide to managers scientifically based tools that they will need for reporting on current status and long-term trends and condition of the trust resources that they oversee. We also want to help them identify management options to sustain and restore ecosystem integrity in their systems, and also evaluate the success of their management actions.

And so this is a work by Glenn and Hillary; I guess you call this the SMI work, salt marsh integrity work that they're doing for the Fish and Wildlife Service. And this is, again, where they're using various protocols to identify monitoring attributes that are directly related to Fish and Wildlife Service management objectives for these coastal marshes and these coastal refuges and determining a minimum and sufficient set of measurements to characterize ecosystem integrity. So we can make sure they get the right data and the right amount. And then develop monitoring protocols that are meaningful for the Refuge in terms of conservation goals. And that they're also feasible to implement.

And so monitoring is conducted regionally on coastal refuges throughout two regions, the northeast and the northwest.

This is work that's conducted by Hillary, she does sea grass work. She's been looking at accelerating loss of sea grasses across the globe that threatens coastal ecosystem health. And as part of the Park Services vital signs monitoring programs, she targets sea grasses as an indicator of coastal integrity. And her work has developed, through the work she's developed methods to simultaneously and efficiently assess condition of sea grass resources and identify causes of change for parks. And this monitoring is conducted regionally on national parks throughout the northeast, from Maine to Virginia and both the Northeast Coastal Barrier Network and the Temperate Network for the Park Service.

And then this work by, example of work by Mary Freeman; the Southeast Regional Assessment Project is deriving downscale global climate models that can be used to develop scenarios of landscape change and consequent effects on coastal terrestrial and aquatic species and resources.

Our primary goal is to develop models that can help resource managers, such as the LCCs that have recently been established evaluate alternative climate adaptation and conservation strategies in a context that includes multiple drivers of landscape change, including climate change, urban growth, and water supply management.

And so here you see an example of Mary's role in this project. Patuxent is collaborating in the aquatics portion of the southeastern assessment (as you see the areas indicated in the red star here) to develop new modeling approaches. And integrate scenarios of climate change with geographic landscape patterns and dynamics of land use and vegetative cover, to forecast potential effects on stream flows and consequences to diversity and distribution of fish and mussel species.

And the third example here is the models are being developed to provide information useful to managers on two scales, two spatial scales. They're being developed for river basins on a coarse resolution assessment. It will help identify where climate change is most likely to affect aquatic species, and what kinds of species are most vulnerable.

And secondly, for individual stream networks on a spatial scale of an individual stream network, the scale of which management (action: 43:21) most often occur, (Fine: 43:23) Resolution Models will allow managers to compare biological outcomes. For example, which fish and mussel species are most likely to persist of different conservation strategies?

And that brings me to this sort of a wrap up synthesis slide, is what we, Glenn and I, call the '4-M's' and I really have to give Mary Ratnaswamy credit for coming out with that sort of the name of this approach.

But this sort of summarizes, in a way, everything that I just presented to you. For example, looking at forecasts and figuring out how coastal systems are going to respond and survive in forecast of accelerated sea level rise. The central graph here, we use everything that I just talked to you about; we use monitoring networks, such as the secure network; we use manipulative experiments, where we can understand mechanisms that drive the processes that drive the changes that are occurring out there.

And all of that information then, of course, feeds into the ecosystem models. And the ecosystem models then allow you to make habitat forecast, from which you can also derive natural resource forecasts. And also, the ecosystems models can also form the basis for decision support tools for analysis of alternative management options. One example is a decision support tool that Glenn and Hillary developed for Acadia National Park about four or five years ago, to help them make decisions on how they can better manage an estuary up there that was getting, that was becoming vulnerable to eutrophication.

And so with that, I'll take questions.

Judd Howell:

Thank you, Don.

Audience Member:

How do you deal with the question of separating sea level rise from subsidence of the land? Or do you have to deal with that?

Dr. Donald Cahoon:

Well, generally, when you want to look at the vulnerability of a... [Sorry]. Generally, when you want to look at the vulnerability of a coastal wetlands to sea level rise, you look at the combination of both of those, it's called relative sea level rise. There's change in the level of the water and there's change, simultaneous change, in the level of the land. You add the two of those together, and that's relative sea level rise. So that's something I didn't go into detail, but that's, we definitely do have to take those both into account.

And the methodologies we use, like such as the SET - Marker Horizon Methodology, allow us to tease apart surface and subsurface changes in the wetland surface. So it helps to give us more understanding of the process of the response for wetland to sea level rise.

I'm not sure who asked that; did I answer your question?

Audience Member:

In a way, I think you're saying that the most (unclear: 46:45) doesn't matter.

Dr. Donald Cahoon:

No, it does matter. I mean...

Audience Member:

Because you're going back to relevant difference... (Unclear: 46:54).

Dr. Donald Cahoon:

No. Well when..., in order for a coastal wetland to... let's just throw some hypothetical numbers in there, if sea level is rising a 3-mm a year, and the local regional subsidence rate is 3-mm a year, that marsh is effectively experiencing a 6-mm year rise in sea level. And that's what it has to survive. So that's what, that's what it has to respond to.

And what we've done without methodology such as Secure, we're able to actually get a tighter estimate of what that relative sea level rise estimate is, by estimating below ground subsidence in the shallow portion of the roots of the substrate.

Audience Member:

How much did OBS in the mid-70s, Office of Biological Services, contribute to some of the forerunner of coastal ecosystems for Patuxent? That was, I think, Chuck Wyckoff (unclear: 48:09).

Dr. Donald Cahoon:

Office of Biological Survey, you mean?

Audience Member:

No, Office of Biological Services.

Audience Member:

That's before it became the..., before your time, Don.

Dr. Donald Cahoon:

Yeah, it was, well I came here 10 years ago, I wouldn't know. Anybody want to venture a response?

Audience Member:

Just wanted to bring in some history.

Dr. Donald Cahoon:

I know that the OBS did, it published a series of important, I mean, you know, Bob

Stewart was involved with some of that too, series of important reports on wetlands around the U.S. Then Carroll Cordes and others were the ones who organized that, so.

Audience Member:

[Unclear: 49:02]

Dr. Donald Cahoon:

First at Patuxent, there was a history of doing coastal research here that was at the very beginning, particularly the Chesapeake and the Susquehanna Flats, looking at ecological processes particularly in the bay. It expanded nationwide when we started doing things like national wetland inventory; we focused on the coast out of the National Wetland Research. And Don was involved in some of the later parts of that, not in the earlier, earlier parts.

And there were a lot of reports that came out coast by coast by coast that synthesized what was known at the time. Probably something that needs to be done again because at that time, you know, you had a researcher that had been working for 50 years on something and then done maybe 100 publications, but had never had the opportunity to put it all together in one document of what he learned. Sort of like you're doing in this two days of looking at what's going, the big picture, that type of thing.

So yes, Patuxent was involved in all of those, those kinds of things. And it had a significant presence, even long before the Office of Biological Services was formed in 1972, '73, somewhere like that.

Judd Howell:

Alright, thanks, Don. We have time for one more question. No, okay, thanks, Don.

Dr. Donald Cahoon:

Thank you.

Patuxent Science Symposium

Friday

Session Moderator: Judd Howell

Judd Howell introductory: Brad Knudsen

Judd Howell:

Our next speaker is not Byron K. Williams, affectionately known as Ken to his friends and detractors. He's not yet in the building.

So we're going to move on to Brad Knudsen, who you have been introduced to before, and has been here as the refuge manager since 19.., yeah, since 1901, since 2001. And I have to say that I really miss the arm wrestling competitions that we used to have on about a weekly basis. Yeah, he won.

But anyway, I think Brad's going to talk to us about cooperation between research and what the refuges need and things like that. So I'm going to turn it over to Brad.

Brad Knudsen:

Okay, thank you, Judd. And it's been nice to have a chance to catch up with Judd a little bit after his departure here and happy retirement. It's been good to touch base with a lot of folks from my past here.

Yes, I was asked to talk a bit about how, specifically how Patuxent supports research, given that that is our purpose. And I just want to back up a second. I really liked Kathy O'Malley's personal interest story about how when she first came here she felt this bald eagle pair sighting was a sign on her first day at work; pretty fortunate.

I also had a sign early in my time here, it wasn't my first day, but I'd say it was into my first six weeks or so. I had received my second favorite voice mail of all time, it was, "Mr. Knudsen, this is So and So, I'm the Weapons of Mass Destruction Coordinator for the U.S. Secret Service, and we need to talk." So, as any good citizen does when they get a call from the U.S. Secret Service, I returned the call as soon as I could. And Mr. So and So wasn't at his desk, but I did leave a message. And the good news is he never called me back. So I can only surmise that means they must have found another National Wildlife Refuge to blow up. I don't know but that was kind of an interesting start.

Just to show some of the variety of issues you deal with at the urban or semi-urban refuges as we have here. And, of course, Patuxent, you know, the original tract of the refuge from 1936, about 2,600 acres. Since that time we have grown to just under 13,000 acres. A huge chunk of the refuge, the largest chunk of the refuge we received in 1991 and 1992 from Fort Meade as part of the Base Realignment and Closure Act. So that basically quadrupled the size of the refuge.

But with that, a lot of strings came attached. Some unusual uses like softball fields, shooting ranges. And if I have a chance, I want to tell a story about the shooting ranges and an impact to some significant research that's been done here over the years.

So it's a refuge that's bombarded by a lot of different interests. Developments are ongoing; Baltimore-Washington Parkway is undergoing a feasibility study for expanding to three lanes north and three lanes south, that could potentially impact some refuge

lands; major developments on our northern boundary that are being proposed.

So there's a lot of different pressures on the refuge, obviously, a lot of different entities, parties that are demanding attention and time. And again, you know, we do the best we can to stay true to our original purpose of supporting wildlife research and serving as a wildlife experiment station was actually part of the language in the Executive Order.

So with that, you can see there's a list of purposes that we've accumulated over the years. The Refuge Purposes Policy that was established in 2000 or 2001 clearly states that the purpose of the refuge drives the wildlife, habitat, objectives, and activities that refuge supports.

Again, (in the bold print, the first one there) to effectuate further the purposes of the Migratory Bird Conservation Act, reserve and set apart as a wildlife experiment and research refuge. That comes from the Executive Order we've seen a few times already, other speakers refer to.

But you can see we've had other purposes tacked on as we've grown in size, depending on the Executive Order or the Legislation or the Transfer Document. The bulk of Patuxent has come through transfers from other federal properties, we've had very little active land acquisition, but we have had some. And you can see that each of those, each time we've grown, we have tacked on an additional purpose.

The one at the bottom relates to the Fort Meade lands that I just mentioned, and that's a fairly long one. But it just says basically it will be managed in ways that are consistent with wildlife conservation purposes.

The hook there is also providing for the continued use of property by federal agencies to the extent such agencies are using at the time of the transfer. So that is why we have shooting ranges, that's why we have softball fields, that's why we have, or no longer have, an active stables. Those are activities that were going on at the time we received the transfer. The deal is basically, and I'm really condensing down the discussions no doubt, but if you want the land it's going to come with some strings attached. And those are some of the strings that were attached.

But, what's important is that our primary purpose again, the first one, supporting wildlife research. That essentially trumps all those other purposes listed.

As we continue to get land through transfers, acquisition, or whatever, that original purpose by the Refuge Systems Refuge Purpose Policy says that original purpose goes with each and every acre you obtain in the future, as long as it's tied to that parent refuge. So in other words, the 8,100 acres at the north tract, that has a research purpose as well.

The Schafer Farm Tract we bought back in maybe the mid-80s or so, that has a refuge purpose as well. It has a specific purpose that also takes that original purpose with it.

And the research purpose is unique to Patuxent; you know many refuge purposes are very generic. Basically, you know, go forth and do good things for migratory birds. Go forth and do good things for the ecosystem at this refuge is a purpose, is a part of. And others are very, very specific.

Horicon Refuge, where I was for a short time, their purpose for that, I think it was about a 20,000 acre National Wildlife Refuge, provide breeding habitat for redhead ducks. That was the driving force at Horicon. A lot of what they did tied to that specific purpose. They of course did other things, they had a lot of upland areas and whatnot, but that was really their driving mechanism.

So, I think it's just important to point out the uniqueness of that refuge purpose we have here. It's not to support a population of a critter, it's not to protect a certain type of habitat. It is to support a function; that function being wildlife research, wildlife conservation science.

A couple of quotes I wanted to mention. Many of you remember Holli Obrecht; he retired a year ago in July, he was our refuge biologist for a number of years here. It's actually not an exact quote because I think Holli, if he was here, he would say, "We never turned away a researcher because we didn't have the right setting for him to conduct his research." I soften that a little bit by saying, "We hardly ever turned away," because I'm not sure we could have 100% batting average. But he was very proud and adamant of the fact that when a researcher came to us, whether it was a staff or a non-staff, you know university or maybe someone from Maryland DNR looking for a site to do some kind of research, we were always able to find a niche for that research to occur.

The quote from Chan Robbins, if any of you saw the film last night, it's really one of my favorite parts of that film where he's in his office and then he says in such a profound way, "That it was Gabrielson's dream to provide a variety of habitats, to continue to study birds, animals in this setting." You know, basically in perpetuity, to provide that variety of habitats. Which is certainly what I believe we have a pretty good track record of having done over the years.

Now there are some forces at work that may change the variety of habitats a bit. But I believe we'll always have a sample of habitats as we do now to continue to provide that sort of variety. But I thought that was very well put by Chan in that film. And, you know, that's the reason we have some of the impoundments we do, that's the reason we have some of the grasslands we do. On an area, on a chunk of landscape that wants

what? It wants to be forest. It really, this area wants to, if left to its own devices, it would be 13,000 acres of forest.

Just a few slides showing some of the numbers; I want to thank Sandy Spencer, our new refuge biologist for helping dig out some of this historical information. Most of this was preexisting, so we were just using existing information, old files and whatnot, but just showing the number of projects that were tracked over the years.

You can see a good general upward trend, but of course a lot of variations over the years. I can't account for those variations myself certainly. I think someone yesterday said it's a little dangerous to talk about history of a place when a lot of the people that were part of that history are in the room. But it just shows the variability. And there's a little gap you can see in the late '90s, or mid-'90s, that coincides with sort of the reorganization going here, you know who had files on what when you were NBS; NBS, USGS, you know, there's a few gaps of information like that.

But if anyone does have some information where any of this could be updated, please send me and we can try to recreate this a little bit.

But that's basically the best information we have. And you can see there's..., it's nice to see such a peak in recent years of, you know, close to 35 projects on the refuge.

I believe (well let me go to the next line, let me go to the next line, I'll be back to that one)... I believe the slide we were just looking at probably includes the staff and non-staff, which you can see the definition of staff is USGS or Fish Research, which we don't do much on our own. If we do tackle something, we're certainly consulting with you; I know Mike Erwin has helped us with some model design on certain habitat practices, Matt Perry has helped with certain things.

But I believe that this chart probably reflects mostly staff research. I'm not sure how much non-staff would have been done traditionally or historically here on the refuge but there's not a designation of that clear in the files, so just consider that total research projects.

This is just looking at it a little bit differently, decade by decade basis. We didn't update it past '97. This is kind of what was in the files that Sandy found for me. But you can see some variation individual decades but overall, a pretty nice upward trend of number of research projects that have been done over the years.

I also can't help but wonder just in knowing how the Refuge System redefines things, asks for information in different ways over the years. Since I've been here, there's three

different ways we are to report refuge visits. So maybe a research project in 1940, the definition was different than a research project that we record now. I'm just saying that there could be some variable, variability based on that too, so. But I think, overall, you can see that it's a pretty active place.

This again just kind of breaks it down from non-staff, to staff, to non-staff. We have universities coming out here; we have, in some cases, the Maryland DNR. Whether its research or monitoring, I guess, if we're issuing a special use permit that's allowing someone to collect some sort of biological or habitat quality information, we kind of lump that in as a research, even though it may not be pure research in terms of answering a question. But, for instance, in recent years we've had both Anne Arundel and Prince Georges County as well as the Maryland DNR coming out here doing some basically stream habitat assessments. Sort of some visual assessments, something quick and dirty that someone can do on the ground and kind of tell, you know, by a quick look the overall health of that particular riparian area, that particular stream.

So those are some of the things that are included here. Again, maybe not pure research in the true scientific sense, but we consider it's a monitoring, it's a time to provide information to managers to answer some questions or to be able to go out and, you know, perform some of these methods themselves. So, it kind of falls in that category.

And again, you can see it's fairly consistent over the last few years with staff research with probably the bulk of that being, for instance, some of the animal colonies and some of the contaminant-type research that's been done in recent years.

Just a few highlights and this is probably the slide I'm most concerned about because, you know, we're naming names and naming periods. And again, people in the room I apologize if anyone is left off. Particularly the longest running, what we were trying to show, what I asked Sandy to look at, was, you know, what are the longest...

[End of CD #4; CD #5: 00:04]

Deanna Dawson were involved in the midst nettings. So as trying to show the continuity of some of these longest running projects that show. I mean I've heard various people say that, you know, Patuxent may be one of the most well studied pieces of grounds among, at least federal agencies, anywhere in the country because of both the long-term nature of any of these projects and the number of projects that have been conducted here over the years.

And then it's also just showing some of the early studies which, you know, Matt gave some great information on earlier this week. But, again, if anyone has an edit to this they

want to suggest or you know some credit that's missing or another example, please shoot me an email or give me a call and, you know, we want to..., I plan to give this presentation more than just today, I'll put it that way, so it would be nice. If there was some missing information or some misinformation, I'd sure be interested in adding that in.

Again, showing the variety of projects that have been done; on the left hand side, kind of going through, you know; fungi, bacteria, plants, invertebrates, reptiles, amphibians, birds, mammals. You know, if it's a living thing, it's probably been studied at Patuxent in some way or the other.

One of the last, well one of the last years Holli was here, we issued a special use permit. I believe it was to a university for someone to study. And forgive me, I probably won't have, you know, I won't even try to get the species, but basically a species of diving spider on the refuge. I'm not sure I'd even heard of diving spiders before that request came down. But I mean on some very specific studies, habitat, niches, where are they, how do they survive. Those sorts of things have been supported over the years here.

And then just some more general groupings; you can see toxicological studies, of course, have been a big part of Patuxent's history, disease studies, moist soil and wetland management studies. Again, you know Matt went over that yesterday. But, you know, a lot of the techniques pioneered here have been applied nationwide; island construction, you know, how to draw down impoundments, time of year, water depths, all those sorts of things. And then some of the more broad environmental type issues that we face.

So how else does Patuxent support wildlife research? As I said, we're just under 13,000 acres, we are not going anywhere, you know we have decades of information on certain parts of the refuge that may already serve as sort of barometer for climate change. We have decades moving forward where we could continue to collect that type of information on the refuge because we don't, you know, we don't plan to be going anywhere, getting sold off or any sort of threats like that. What's refuge today should be refuge tomorrow.

Providing secure locations for animal colonies; I think we have around just the footprint is, I think, close to 250 acres for the Whooping Crane colony, and then of course we sort of buffer around that. That's a relatively secure area where we know in general the public is not going to get to it. Yes, there's exception. Yes, there are trespassers. It does happen. But, but we have a relatively secure location for that colony, for the, you know, the Screech Owl, which had recently been relocated but..., and kestrel colonies. Not just the footprint where it's located, but the buffer area around it, so.

You know, quite a bit of real estate that's devoted to animal colonies and its real estate, that is, is pretty much secure from outside influences.

We do try to manage our public use in a way that minimizes impacts, threats to research. You know, what about 10 or 11 years ago, we did have the first deer hunt on the central tract, which that just barely predates me, but I understand it was, you know, subject to great debate, a lot of concern from the research community. This had been, you know, for whatever, 65 years a closed facility; you know, basically no public on it. And, gosh, we're going to be inviting hunters on, you know, with shotguns and some cases, archery. What, does that mean? And there is a great deal of concern and consternation on the research community's part. And I can understand that. And I think we've had a really good track record.

And basically it was being done, of course, because the deer were running roughshod over the habitat and a lot of the habitat you all were trying to study was getting eaten up by deer herds, so we had to try to do something to control the deer. And in general, I think, we've gotten pretty good results from that hunt. The population isn't nearly what it was back before we started hunting. Probably have a ways to go in terms of recovering some of the, you know, the brow and forest undergrowth. But that's been managed in a way that has very little conflict from, what I understand, with the research going on. You know, we manage it in a special way near the Whooping Cranes, you know; no gun fire allowed near the Whooping Cranes at all. It's all archery. So we try to take those sorts of precautions that..., to support the research that's going on here.

The Visitors Center, the building we're in right now, it was basically constructed, the major thrust being to support scientific information exchange, conferences, symposiums, workshops. We have, you know, consulting firms that do wetland delineation training here. We have wildlife habitat council that comes out here every now and then for retreats with their board. They deal with private entities, corporations, and have them do good thing for wildlife on their, on their corporate lands. USDA comes out here.

Basically, if it's a natural resource or natural science, wildlife science type meeting, we will, you know, allow them to use this building. We don't host, nothing against Mary Kay, but we don't host Mary Kay, you know, conventions or those sorts of things. It has to have a resource-based purpose to the meeting.

So we have, you know, thousands of people here over the years annually that are involved in those sorts of meetings. And, you know, just the brainwaves that have been going back and forth here over the last day and a half, I think, is probably the best example of that sort of purpose in this building.

But also the cool location with the Division of Migratory Bird Management Offices, you've already heard about some of the collaboration between those folks and USGS. That's, I think, important to enhance communication to, you know, just kind of the happenstance of what they're working on, what you're working on, 'Oh gee, there might be a brainchild that leads to really important research opportunities, monitoring opportunities, whatever.'

In another way, it may be a little bit more out in left field, but the volunteer program that actually both agencies are involved in. I'm not sure what you're all numbers are, but for the Fish and Wildlife Service every year we have volunteers contribute at least 20,000 hours and in many cases, closer to 30,000 hours of time to the refuge.

And I know that there are a number of volunteers that help with the sea duck colonies that help with the Whooping Cranes. And many of those, you know, become advocates, they're out in the community talking about the great things Patuxent is doing. So in some, you know, circuitous way they are hopefully providing some grassroots support for Patuxent and what we do, both on the refuge side and on the research side.

So just some thoughts on the future research here; I came here about a month before this MOA between USGS and Fish and Wildlife Service was signed, and at least some of you were probably involved in some of those discussions when we were first being charged with implementing it. That's when I first started working with Jim Kushlan, and then Judd inherited many of the details that we had to try to work through on this MOA that was a bit cumbersome to work through some of those details.

But that clearly states (and this was an MOA signed at the director's level at the time, the directors at the time) that the research conducted on Patuxent should be projects important. Well you can read it. Basically, the DOI, Fish and Wildlife Service and others, other State Fish and Game agencies and other agencies in the DOI in terms of priority research. We also grandfathered in a number of research projects that'd been ongoing for a number of years.

So it's a pretty broad definition for priority research. And I think we can make things fit quite well if it's answering a resource question. Probably the broader the better, certainly if it applies to several federal lands, federal agencies the better. But it's a pretty broad definition and I don't feel that definition has hampered anything in my time here as far as, "Oh no, we can't do that. That's not considered priority research."

My take on things is, you know, if it's a proposal that's not conflicting with a major public use or, you know, is a major change to some program that's been around for awhile. Even if it's not priority research, if a university student wants to come out here and study

diving spiders. What harm is that to us if it's managed properly and they're out here, they're collecting information? You know, it may be just student and a select few that care about that.

But I've really come around. I've told my staff this a couple times as we've been going through our Comprehensive Conservation Planning, I've really come around to, 'I'd rather have the information and not need it, then need the information and not have it.'

And the Refuge System is really pushing for, you know, priority monitoring, don't count things just to count things. I understand that and I support that. But also, how do you know? It may be important that you counted that thing.

We were named an important bird area by Maryland Audubon Chapter about maybe five or six years ago. And I don't know if any of you know Dave Curson, he's the director of that chapter. He said one of the things that really tipped the scale in Patuxent being named an important bird area was the fact that the information we have been collecting for years on Whippoorwill through our annual Whippoorwill surveys show that we supported one of the largest, if not the largest population of Whippoorwills in the State of Maryland. When I came here and I heard we were doing Whippoorwill surveys I thought, 'Why are we counting Whippoorwills?'

And, you know, that's partly my ignorance, but that was my initial reaction. And a few years later, talking to Dave Pearson, well, that's a good reason that we were counting Whippoorwills. It helped us be named as an important bird area. Which can help with, you know, grants, can help with recognition, can maybe draw birders here. Again, more visitors, more support to the refuge. So I think that was important. And so I'm glad we were counting Whippoorwills all those years.

Some of the other emerging issues, I guess, as they're called, of course a lot of work has already been done on habitat fragmentation. But, you know, we are becoming more and more of an island every year. Since I've been here I've seen, you know, more soccer parks go up, I see major construction projects along Highway 1. I'm seeing, you know, we're just becoming more and more of an island.

What are the impacts; you know, what of the travel corridors being impacted by the urban wild land interface, climate change, of course, invasive species management?

It seems like every year we've learned of another invasive species or two that's invaded the refuge and, you know, what's the best way to kill those things? What's the best way to manage those things or control those things so we don't..., I think wavyleaf basketgrass is one of the more recent ones that was pointed out to us. So we know we're being

overrun. What are the best management techniques to keep invasives at bay?

And then a big fairly simple question, but I'm sure not easy to answer, "How do we fit in the landscape scale conservation?" Which again, we've heard, you know, that's becoming more and more the bread and butter of what the research center is doing here. How do we fit in? We know that we can probably make a bigger contribution to forest birds than we ever will make towards shorebirds or waterfowl.

Now we've, you know, we've managed a number of years, a number of impoundments for those other critters. But what could the impact be to forest interior dwelling birds if some of those areas went away and we started trying to support and raise more forest interior dwelling species? Those are some of the questions we're dealing with in our comprehensive conservation planning.

And as far as fitting into the landscape; July 5th of this year was kind of a "red letter" day for Patuxent. Some of you may have heard about this, but it's a good place as any to share this information now. We are involved in our CCP; we're part of the 15-year plan for the future of the refuge. As part of that, we were given the opportunity to put together a Preliminary Project Proposal for a potential refuge expansion. That Preliminary Project Proposal, which was..., a lot of the information that went into that we got from Dan Murphy at the Chesapeake Bay Field Office, their coastal program manager. He wrote the bulk of that project. That was approved by the director this past summer; a huge step.

You know, since I've been here I pretty much heard all of that, "We can't really buy land in the Washington or the Baltimore-Washington Corridor, it's expensive." You know, we can buy 10 acres for the price of one acre and it's been really difficult. I mean, we haven't purchased any land here since the year before I got here. And I kind of come from a long line of land grabbers, and that's been kind of frustrating for me.

So it's really great to have this opportunity. You know, we're not there yet, this is the first step. The next step is a land acquisition plan, which kind of gets down to the nitty-gritty on naming names, developing focus areas within the broad areas that right now we've identified, which is six counties in southern Maryland and Patuxent River headwaters.

And the recommendation is to protect an additional 40,000 acres through an easement and/or fee acquisition and also, you know, working with the state, working with land trusts to protect an additional, I think it's, gosh, I think it's close to an additional 200,000 acres; so extremely aggressive. Of course, there's zero money for it at this point. But at least we have the permission to develop a plan, and we hope it won't be a plan that just sits on a shelf like many plans do.

But this is from the PPP showing the, I think there's six different focus areas that have been identified. You can see Patuxent is there in the red. So we're going a little bit upstream or going all the way when I had kind of a serendipitous meeting with (Oh gosh, now I can't think of his name. Oh rats, with the conservation fund)

Audience Member:

Pat Noonan?

Brad Knudsen:

Thank you, yes, thanks, Frank.

Audience Member:

No, Frank's next door, that was Bob... Oh, it's Paul.

Brad Knudsen:

Well, thanks, Paul. Don't tell Pat I couldn't remember his name. But he said, "Brad, you need to take this plan, take it to the beach." That's exactly what he said, "Take it to the beach." So you can see, you know, we used some lands going all the way down to the bay, so. And I think where, again, where this plays into the research center's role is, you know, there's a lot of information on state focus areas, state areas of concern, I can't remember all the different acronyms. But, you know, you all have worked in some of these locations, you all probably have some really good information that may help us narrow down that huge sprawling boundary and say, "Well, here's some, you know, there's some really important resource of concern here we think you should be considering as you move forward with your acquisition." So I would lean on you to, as we move through this process, probably be tapping some of you or offering some of you the chance to weigh in. You know, where should we focus in some of these efforts within these, what we're at this point calling, focus areas.

So, I'm just about ready to wrap up. One last way that I feel we support wildlife science is, you know, we have 200,000 visitors plus a year coming here or to our north tract. Many of those are children, we have around 8,000 children, you know, several hundred teachers out here. But, you know, we've focused an awful lot, on our youth. Trying to get them interested in nature, give them good quality repeated experiences outdoors.

And I'd like to think that through that maybe, just maybe, the next Rachel Carson or maybe the next Ira Gabrielson or maybe the next Lucille Stickel has already walked through our doors and into one of our educational programs. So I kind of keep my fingers crossed about that.

So with that, I try to leave time for questions but not enough time for answers today. Thanks.

Judd Howell:

Thank you, Brad.

Patuxent Science Symposium

Friday

Session Moderator: Judd Howell

Judd Howell introductory: Glenn Olsen

Judd Howell:

Dr. Glenn Olsen has been a veterinarian here since 1987, and been involved in a great number of studies, especially with the cranes and other wildlife species here. And he's going to talk about the changing role that he sees in wildlife diseases from a global perspective.

So let's give Glenn a round of applause and welcome him to the podium.

Dr. Glenn Olsen:

Alright, thank you, Judd. I got a haircut for this event, Judd.

Alright, just a few insights here; for those of you who haven't seen it, that's what the book looks like, *Silent Spring*, in person. You heard yesterday about all the folks talking about Rachael Carson and how they met with her, etcetera.

Today we have the younger crew here because this is the 5th Edition, and I got it as a present from grandparents when I was in grade school.

So, I'm here to talk a little bit about wildlife diseases from a global perspective. And to do so I'm going to back up a little bit here and first of all talk about what a wildlife disease is.

You all sort of know what disease is, I think; disease is when you don't feel well. Basically, it's, you know, abnormal changes in a function or structure of a living body or population. And it can come from infections with microorganisms or pathogens in the body tissues. But from a traditional disease standpoint, it also can come from exposure to noninfectious agents such as poison, contaminants, or from cellular neoplasia or cancers.

And we've heard a lot about contaminants, and contaminant really is a subcategory of diseases. Though here at Patuxent we sort of look at diseases as being infectious and contaminants as being something different, but contaminants are really diseases also.

I'm not going to talk about contaminants though. Today I'm going to pretty much confine myself to more infectious diseases, with one possible exception here.

Matt, when he approached me about this, said, "Well, talk a little bit about history also." So, I looked into the early history of wildlife disease studies at Patuxent; the first paper was actually published in 1941 on diseases of upland game birds. L.C. Morley, as you may recall, was the first superintendent or what we call now a director, the first leader of Patuxent, and he was actually a veterinarian.

The first mammalian disease paper was published in 1942.

And from 1941 to present there's been 190 publications on avian diseases by, with one or more Patuxent authors; 58 on mammalian diseases; 5 on amphibian or reptile diseases; and one fish paper.

Alright, so I've already mentioned Leland Morley was the first superintendent, was also a veterinarian. He established the Wildlife Pathology Laboratory.

Originally, my understanding is this was in, it was in Henshaw. And Patuxent scientists also helped to form the Wildlife Disease Section of the North American Fish and Wildlife Conference at the time.

And there were wildlife disease scientists that also supported research in a contaminant branch through necropsies and histopathology at one time.

Some of the earlier wildlife disease researchers are listed here. As you know, we have a, we had a Coburn Building and a Coburn Annex named after one of the first veterinarians here from 1938 to about 1948, Don R. Coburn. These are some of the other folks that worked in the Wildlife Disease section.

And these are some of the folks that worked in the period of about 18--, 18--...; 1960 to 1980s, late 1980s. And some of these names are still familiar to us; Lou Sileo just recently retired. And Chris Franson, of course, still works at the National Wildlife Health Center. Josh Dein also still works there.

Our Wildlife Disease facilities besides Henshaw and later Stickel were used for wildlife disease research, but we also established a veterinary hospital at Patuxent. As near as I can tell, the veterinary, the original doublewide trailer that was down in the endangered species area dates back to somewhere between 1966 and 1970 or '72. And possibly somebody can correct me on that, but I've talked to people who say it wasn't there in '66, but it was there a year or two later.

But basically, that facility we used up until about 1994. It was a very crowded facility. We, at one point, added extra office space by moving another trailer park, another trailer into there, and it was referred to as the 'Vets Trailer Park' for a while.

And then in 1994, in December 1994, we opened the present veterinary hospital with funding obtained from outside sources by our director at the time, Hal O'Connor.

We currently house myself and other disease specialists, mainly Samantha Gibbs from (her picture's here), she's a U.S. Fish and Wildlife Service employee, and we share the building. And we also share the building with Carlyn Caldwell, our technician, and then

two folks from the Endangered Species Branch, from the Whooping Crane Project, have offices there also; alright.

Okay, just a little bit about early endangered species research. The cranes were the first species studied at Patuxent, as you've heard from other talks, from Glenn Smart's talk today. They were also the subject of early endangered species research.

But we also did research on diseases with Black-footed Ferrets, Condors, Canada Geese, Wolves (as you also heard with the parvovirus), and Bald Eagles have all been studied in the Endangered Species Area at Patuxent.

1975 was a big year of change for the wildlife disease studies at Patuxent. In 1975 Patuxent's Section of Disease and Parasite Studies was transferred to the then new National Wildlife Health Center in Madison, Wisconsin.

I find this very interesting because, of course, this was Milt Friend, that most of you or a lot of you have heard about was the director, and he established this new research center. It would be interesting some time to count up the number of research centers that evolved from sections or field stations of Patuxent.

But Milt established this new research center at the direction of the head of Fish and Wildlife Service at the time, and took with him the section of Disease and Parasite Studies from Patuxent. And that's where some of these people that were Patuxent employees transferred out to Madison over the years.

It also is interesting to me from my standpoint because in the, I know it was early, late '70s or early '80s, I think it was the early '80s actually, Milt Friend came to the University of Massachusetts, where I was a graduate student at the time, and stole my major advisor to become his deputy director out there. So, I can understand how folks at Patuxent felt in '75.

The Environmental Contaminants Program; now this is interesting, one of the histories I read said that there was an Environmental Contaminants Program that existed at the Denver Wildlife Research Center. And in 1975, that was transferred to Patuxent. So, I've not heard anybody else make that statement, but I found that in one of the histories and I think that's interesting.

Most of the remaining wildlife disease researchers that were left at Patuxent focused on toxicology studies and supported the toxicology studies with doing the necropsies and the histopathology.

This is just, remember I mentioned the publications before, but you can see there is a fair number of publications up until again the mid-70s, when they drop off fairly sharply because of the transfer of this one group out to Madison. And then a few spikes and then sort of an upward trend here in the last few years, and we're going to get to that in a few minutes here.

Alright, over the years there's been a couple of major mortality events at the crane colony. In 1984 there was an outbreak of Eastern Equine Encephalitis that killed seven adult Whooping Cranes. And in 1987, mycotoxins killed 15 cranes, including five endangered species.

In this lower picture taken at the 1987 mycotoxin outbreak (that's me if you don't recognize me in my younger form), this is actually Nancy Coon, who was my supervisor at the time, and this is her husband and daughter helping to treat cranes. It's, you know, really unusual that you can get your boss's husband and daughter to come out and help you do your work.

From the 1980s mortality events there's a couple of things that came out of this, but one was a testing program to,and improve feed storage and handling to help eliminate the mycotoxin problems for the cranes and for other captive species. And that's why we have these multiple coolers and freezers around the center currently, to help store some of the animal food.

But the other thing that's probably even more interesting is we started a vector monitoring program to detect mosquito-borne diseases. And Judd, or Judd, pardon me..., Brad, you can add this to your list of long-term studies. This started in about 1985, and I can actually verify the date if you want, and it's been ongoing since then in cooperation with both, at one time the U.S. Army and with the Maryland Department of Agriculture. Where we collect mosquitoes on the center, identify what type of mosquito-borne viruses they are carrying, and also monitor the, at least as far as Eastern Equine Encephalitis and at one point West Nile virus in the bird populations here.

And, of course, Patuxent's existing mosquito monitoring program came into play when we were hit with West Nile virus. Because we'd already had a mosquito monitoring program in, so we could monitor what was happening as far as West Nile virus goes.

We've done, over the years, a lot of research in West Niles Virus on Sandhill Cranes and in Screech Owls. We've done vaccination studies to protect the birds, to learn about protecting the birds. And research on the passage of maternal antibodies has been conducted with the Screech Owls; Dr. Caldwell Hahn did a lot of the Screech Owl, or did all the Screech Owl work here at Patuxent.

Also in our list of folks that do research in diseases is Dr. Howard Ginsberg, our colleague who is stationed at the University of Rhode Island. And he has done a lot of interesting studies with different disease vectors, and currently he's looking at a study with Lyme disease geographical gradient study. Basically looking at, you know, why does Lyme disease occur in certain tick populations and not in others.

Alright, now we're going to get into some of the real interesting local stuff. In addition to West Niles Virus, which came along in the early 2000s, in 2000, mid-2000s to 2005, there was a global die-off, or there was a die-off of wild birds at a place called Qinghai Lake in the middle of China.

And this was unusual because we've know about avian influenza that's been around for years and highly pathogenic avian influenza had been around for a long time. But normally it affected chickens and occasionally people, but not necessarily wild birds.

So the question was, these were wild migratory birds stopping over there, were wild birds the method of spread for this particular disease or were they not? Were they victims of the disease or were they vectors of the disease?

And USGS began a Wild Bird Avian influenza Program that involved a lot of monitoring for avian influenza on the part of our friends up in Alaska. But from the Patuxent standpoint, led by D. Prosser, we began studies on the role wild birds play in spreading, in possibly spreading highly pathogenic Avian influenza or H5N1.

And virology alone was not the answer to the question, because we for one thing didn't know a lot about migratory pathways, where birds in Asia and Africa migrated there. In spite it being well documented in North America from our great bird banding program, there wasn't any really good massive continent-wide bird banding program in places like Asia or Africa.

Okay, so basically I'll try just going on a little bit here. Basically we were looking at what happens. Number one, is there a flyway? We knew that there was this place called Poyang Lake where there was a lot of H5N1 in chickens and in human population in that area, and were the birds going, were wild birds picking up the disease here? And did they transmit it to Qinghai Lake?

And so what happened was through the auspices of the Food and Agricultural Organization, there was a large grant made. And USGS, both us, the folks out in California and in Alaska worked on this project jointly to implant, or put backpack transmitters, depending on the species. We did 20, I've got in the slide, but I think it was 23 species of birds over a three-year period in various countries. And looked at the effects, or looked at, among other things, different flyways.

Audience Member (D. Prosser?):

So back in 2005 is when really the global debate started on how wild birds might be involved in the spread of Avian influenza. And it really started at that spot, Qinghai Lake that Glenn showed you on the map. It's on the edge of the Qinghai-Tibetan Plateau. It's a very remote region, there are Nomadic herders that live there, and there are very few poultry in the area. Yet, more than 6,000 wild birds died for the first time of this disease, highly pathogenic H5N1. And as many know, wild water birds are the natural reservoir for low pathogenic forms of avian influenza. It was very unusual for this to happen. So once that outbreak occurred, it was almost as if wild birds were immediately implicated in the spread of avian influenza because soon after that, in 2005, it happened in the spring of 2005. Then in the fall it spread up out of Asia into Europe. And then in 2006 it was in Africa. So, I will let Glenn pick up from there.

Glen Olson:

Alright, so one of the things we discovered was that there were these two distinct flyways, at least for waterfowl, that there was no crossover between Poyang and Qinghai

Lake, what's labeled now the Central Asian Flyway though, there was also, that many of our birds went over toward Lhasa, Tibet. Where there were of course poultry and farm fields, where they would, where there would be the most spatial and temporal concordance between outbreaks in wild birds and wild bird movements, and outbreaks in poultry.

And so the likely transmission to Poyang Lake was from wild, from domestic birds in the Lhasa, Tibet area to the wild birds, who then carried it to, to Qinghai Lake, pardon me, not Poyang Lake.

In the eastern area, in the Eastern Asian Flyway, there were outbreaks in various places, and especially on the Korean Peninsula. And there were Whooper Swans that went back and forth over this area. But there was, there was spatial overlap, they used the same areas where the outbreaks occurred but not..., didn't occur at the same time.

And as D. has pointed out, we did studies in a number of different countries, looking at where there were major outbreaks of H5N1, looking at some of the migration pathways and the movements of birds in these areas; four countries in Africa and a number of countries in Asia, including India, Kazakhstan, Mongolia, also in Hong Kong and in Turkey.

Alright, so where do we go with wildlife disease research in the future here at Patuxent? Certainly we're going to continue emphasis on the diseases of Whooping Cranes and other endangered species as long as we have them here.

We're going to be looking at and examining foreign animal diseases that pose potential threats to our endangered species, such as West Nile virus did.

We're going to also be looking at increased trends in novel or introduced diseases occurring worldwide. Certainly the impacts of diseases on wildlife affect things like survival, fitness, reproduction, population numbers.

And disease, of course, is..., many of our diseases in fact some folks estimate 60% to 80% of the diseases in people that are a major concern now. And the emerging diseases are what we call 'Zoonotic,' where they infect not only people but some form of wildlife or, and/or domestic animals.

We want to get a better understanding of disease transmission, pathology, epidemiology, and ecology. And this is necessary for disease management in wildlife.

We talk about the invasive management of diseases. And this is how diseases are treated in people most of the time; you go to your doctor and they give you some pills or an injection to help fight the disease, or vaccinate. And this kind of treatment is, of course, very limited for wildlife. So we've got to look at other things in wildlife.

One of the other things that we're looking at is exploring links between genetics, animal fitness, and wildlife diseases.

The other thing is, of course, what effect is global climate change going to have on wildlife diseases? Wildlife serves as a potential reservoir for a number of different pathogens and they also act as indicators, as we've heard, of ecosystem health.

And global climate change can affect the transmission dynamics of a lot of these pathogens. A lot of them require vectors; some of them don't require vectors but require certain conditions in the environment. And there's going to be changes in these diseases, in the geographical distribution and the incidence of these diseases and of the vectors.

And, you know, one prime example is, of course, the Hawaiian forest birds. Where a lot of the forest birds that are described lived above a certain elevation because the mosquitoes that carry the malaria don't go that high. But, of course, as we get global warming, the temperatures may warm up on the mountain and the mosquitoes will be able to go, in fact we've already seen this, go higher on the mountain.

Global climate change can cause wildlife disease to intensify, spread or shift. And it can lead to increased emergence and severity of some diseases.

And global climate change may also result in increased invasion of pathogens from tropical to temperate climates. And we've already seen this with such things as the West Nile virus outbreak. And, of course, West Nile virus only spread so far into southern Canada but no further. Even though there are mosquitoes much further north, they're not the proper species at this present time to spread the disease.

So, you know, what are some of the recommendations? Certainly increased coordination and collaboration among human health, agriculture health and wildlife health specialists, and we've already seen some of this happening.

But also improve capacity at the federal, (and this includes USGS and the Fish and Wildlife Service) state and local level to conduct disease surveillance by wildlife agencies.

One of the, you know, interesting things, of course, as a veterinarian, you know, why did I get into wildlife? Well, I really wanted to work with wildlife all along. It wasn't that I became a veterinarian and then wanted to work with wildlife; I was interested in wildlife when I went to veterinary school.

And one of the reasons I went to veterinary school was because at the time Wyoming had a wildlife veterinarian, and for some strange reason the little library at our high school in Illinois got copies of *Wyoming Wildlife* that I read every month. And, you know, and there was this wildlife veterinarian there and I thought, 'Well gee, that would be an interesting career.' He was the only wildlife veterinarian at any state agency in the country at the time, so I don't know what I was actually thinking, how many job openings there were.

But, today, most states have a wildlife veterinarian and Cindy Driscoll is with us presently, and she's the wildlife state veterinarian for Maryland. She was a former

Patuxent employee in the 1980s; you've seen her picture up here on one of the earlier talks.

So, you know, so today there's many wildlife veterinarians in state agencies and of course, in the federal government. Dr. Samantha Gibbs, who works with me, is working on a monitoring program actually for, originally for avian influenza for the Fish and Wildlife Service; now she's working on avian diseases in general.

So, we're getting toward this. But, of course, we also need increased funding for research, and that should be (unclear 1:20:49) should be separated there I see. And to study wildlife disease, of course, you know, this always the way you end a talk is plead for more money.

Alright, here's just other pictures from over the years at Patuxent. A couple of pictures in the two corners of the wolves of Patuxent; we once had three wolf pups here that were supposed to go into a display for the Visitor Center, the new Visitor Center that was being built. We were going to have live animals on the Tram Tour. And the wolves were the first part of that program. And that's another story for another time.

So, I don't know, do I have time for questions?

Judd Howell:

Yeah, I think we have time for a couple of questions if we have them.

Glenn Olsen:

I see somebody over here raising a hand.

Audience Member:

We're just wondering where the wolves went?

Glenn Olsen:

Where the wolves went? The wolves came from a wolf breeder somewhere in Indiana, I think. And I believe they went back to the breeder, we only had them for about a month. So, and believe it or not, they were housed in Snowden, that's another use that Snowden was used for. For raising wolf pups, endangered wolf pups. So yeah, they were housed on the upper floor of Snowden. They had outfitted a room for them up there. You can see in the pictures, you know, wire up part way up the walls, etcetera to protect them. And we were trying to, to what they called 'man' them, or get them used to people so that they wouldn't be hard to handle as they grew up. And that's why people were interacting with them like this. There was no intention to release these wolves. They were going to be; well, they were bred for captivity, so.

(End of transcript)